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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/929,849	08/14/2001	Brian Christopher Hart	2001-0128.00	9848

21972 7590 02/21/2003

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EXAMINER	
CULBERT, ROBERTS P	
ART UNIT	**PAPER NUMBER**
1763	9

DATE MAILED: 02/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/929,849	Applicant(s) HART ET AL.	
	Examiner Roberts Culbert	Art Unit 1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 February 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-11 and 13-20* is/are pending in the application.

4a) Of the above claim(s) *8-11* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-7 and 13-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *2-11 and 13-20* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

The Declaration filed on 2/4/03 under 37 CFR 1.131 is sufficient to overcome the Powers reference as well as the Mrvos and Patel references.

Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Response to Arguments

Applicant's arguments filed 2/4/03 have been fully considered.

Applicant's arguments with respect to the Powers, Mrvos and Patel references have been considered but are moot in view of the new ground(s) of rejection.

Applicant has argued that the prior art does not teach the equivalence of grit blasting and laser drilling. The argument is persuasive. However, the argument is not relevant in view of the new grounds of rejection cited below, because the reference teaches that grit blasting is a superior method for forming the ink slots (i.e. the improved efficiency and economy).

Applicant has argued that the Verley reference does not show the use of a protective layer prior to grit blasting and that there is no motivation in the prior art to suggest the use of a protective layer. The argument is not persuasive because the Verley reference provides the suggestion that grit blasting may be advantageously substituted for laser drilling in the Rogers and Murthy references. There is no requirement that every reference have every feature of the invention. The motivation to use grit blasting in place of laser ablation is clearly provided in the Verley reference as stated in the rejections below.

Applicant has argued that since the Rogers reference does not teach fabrication of ink jet heater chips or the use of grit blasting to form slots in ink jet heater chips and therefore there is no motivation to combine the Rogers reference with any other reference. The argument is not persuasive because the motivation to combine does not necessarily have to come from any particular reference. The rationale to modify or combine references may come from the references themselves or from the knowledge

generally available to one of ordinary skill in the art. See MPEP 2145. In this case the motivation to combine references does not come primarily from teachings in the Rogers reference, but from the Verley and Murthy references and other teachings in the cited prior art as stated in the rejections below.

Applicant has argued that that the examiner has failed to provide one iota of evidence that it would have been obvious to grit blast the vias from the side of the wafer opposite the device layer. The argument is not persuasive because the evidence is provided by the applicant in the background of the invention as stated in the rejections below. Furthermore the reason is given: One of ordinary skill in the art would have been motivated to perform the ablation in this manner in order to prevent the particles from damaging the components. The rationale to support a rejection under 35 U.S.C. 103 may rely on logic and sound scientific principle. See MPEP 2144.02

also in background

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6 and 19 and are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,454,928 to Rogers in view of U.S. Patent 5,105,588 to Verley, and U.S. Patent 6,045,214 to Murthy et al.

Rogers teaches a method for forming ink vias completely through a semiconductor circuit substrate using laser drilling. Before the step of laser drilling, Rogers teaches the application of a water-soluble polymer layer to protect the surface from debris (Column 2, Lines 52-55). The coating is removed along with the debris after the drilling step (Column 2, Lines 59-61).

Rogers does not teach the use of grit blasting to form the vias through the semiconductor substrate or the use of the vias as ink channels.

Verley does teach that ink channels may be formed in a semiconductor substrate using grit blasting. (Col.1, Lines 15-40). It would have been obvious to one of ordinary skill in the art at the time of invention to use grit blasting to form the ink channels as shown by Verley.

One of ordinary skill in the art would have been motivated to use the alternative method at the time of invention in order to avoid the problems, such as reduced economy and efficiency, associated with laser and ultrasonic drilling as clearly stated by Verley (Col. 1, Lines 30-31).

One of ordinary skill in the art would have been motivated to use the protective layer with either drilling technique because both methods of drilling inherently form debris from the ablated material that may impact the device surface.

Further motivation for the combination is provided in the Murthy reference. Murthy suggests the use of a protective layer to prevent debris from reaching the device surface in the formation of ink channels in an ink jet printhead (Col. 2, Lines 45-50).

Rogers does not teach the use of a photoresist or a silane adhesion promoter to provide nozzle plate attachment.

Murthy does teach the use of a photoresist layer (104) prior to the application a temporary protective layer (106) prior to the formation of ink channels (Col. 4, Lines 1-8).). It would have been obvious to one of ordinary skill in the art at the time of invention to use a photoresist layer as shown by Murthy.

One of ordinary skill in the art would have been motivated to use the adhesive layer at the time of invention in order to enhance adhesion between the nozzle plate and substrate as clearly stated by Murthy (Col. 4, Lines 3-4).

Regarding Claim 6, Verley teaches the use of aluminum oxide and silicon carbide for grit blasting vias in a silicon ink-jet substrate (Column 1, Lines 46-47). It would have been obvious to one of ordinary skill in the art at the time of invention to use the particles suggested by Verley in order to suitably form vias in the silicon substrate using grit blasting.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rogers in view of, Verley and Murthy and in further view of U.S. Patent 4,950,583 to Brewer et al. As applied above, Rogers, Verley and Murthy disclose the method of the invention substantially as claimed, but do not show the use of a silane adhesion promoter before the photoresist is applied. Brewer teaches the use of silane adhesion promoters in the application of a photoresist to a silicon substrate (Column 1, Lines 36-41). It would have been obvious to one of ordinary skill in the art at the time of invention to use the adhesion promoter described in Brewer.

One of ordinary skill in the art would have been motivated to use the silane adhesion promoter in order to increase the adhesion of the photoresist to the substrate.

Claims 2,3,5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rogers, in view of Verley, and Murthy and in further view of U.S. Patent 4,009,113 to Green et al., U.S Patent 5,286,703 to Wachi et al. and German Patent DE 4123900 to Rosen.

As applied above, Rogers, Verley, Murthy and Kamiyama disclose the method of the invention substantially as claimed, but Rogers does not show the use of a polyacrylamide layer. Rogers does teach the use of a water-soluble polymer as a temporary protective layer. Green teaches the use of polyacrylamide in a temporary protective coating (Col. 4, Lines 20-32). Polyacrylamide is known to be a common water-soluble polymer used for protective layers. Evidence of this fact is provided in Wachi (Column 27, Lines 55-68). Motivation to use a protective polyacrylamide layer is also provided in the Rosen reference (See Abstract). It would have been obvious to one of ordinary skill in the art at the time of invention to use one of the water-soluble polymers of Rosen in order to suitably form a temporary protective coating that prevents debris contact as stated in Rosen.

One of ordinary skill in the art at the time of invention would have been motivated to use any water-soluble polymer known in the art that meets the stated requirements. Murthy suggests using polyvinyl alcohol but also points out that any polymeric material may be used that is coatable in thin layers and is soluble in a solvent that does not interact with the adhesive layer (Col. 6, Lines 47-50). Water is clearly the preferred solvent (Col. 6, Lines 58-60). Given these parameters, there are a limited

number of polymers that have the desired characteristics. The polymer must have a linear or branched poly-alkane backbone with a sufficient number of hydrophilic groups to make the polymer soluble in aqueous phase, a tensile strength that is sufficient to resist mechanical degradation, a molecular weight that permits a melting point between approximately 40 and 90 ° C and a relatively low commercial production cost per pound to permit economical manufacturing. Note that the lower range limit for melting prevents degradation at operating temperatures and the upper range limit prevents damage to the other parts of the substrate at high temperatures.

The selection of a known material based on its suitability for its intended purpose supports a *prima facie* obviousness determination. See MPEP 2144.07.

Claims 13, 17, 18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rogers in view of Verley and Murthy, and in further view of U.S. Patent 5,677,063 to Kamiyama et al., U.S. Patent 5,719,605 to Anderson et al.

As applied above, Rogers in view of Verley and Murthy disclose the method of the invention substantially as claimed, but do not teach spin coating the adhesive layer or the protective layer.

Murthy teaches that extrusion roll coating blade coating spraying, dipping and other known methods may be used to coat the adhesive layer (Col. 6, Lines 44-47). Kamiyama further teaches that spin coating, blade coating and roll coating are known methods for the purpose of forming a thin layer of polyacrylamide (Column 27 Lines 15-21). It would have been obvious to one of ordinary skill in the art at the time of invention to use spin coating in order to suitably deposit a fluid polymer layer on a substrate.

The finishing steps of attaching nozzle plates, dicing the wafer, connecting TAB circuits, and connecting the nozzle plate/chip assemblies to printhead bodies to form printheads, are well-known in the art of forming ink jet printheads as shown in Anderson (See for example, Figures 2 & 3). It would have been obvious to one of ordinary skill in the art at the time of invention to apply the same finishing steps in order to complete the printhead assembly in the well-known manner.

Regarding Claims 17 and 18, Rogers does not teach the thickness of the adhesive and protective layers.

However, Murthy anticipates the claimed ranges for each layer (Col. 6, Lines 30-42). The photoresist thickness is 1 to about 25 microns and the protective layer thickness is at least about 1 micron.

It would have been obvious to one of ordinary skill in the art at the time of invention to use the ranges suggested by Murthy as a guide in order to provide suitable protection for the device, and permit adhesion of the nozzle plate in the well-known manner.

Regarding the step of grit blasting, it would have been obvious to one of ordinary skill in the art at the time of invention to grit blast the vias from the side of the wafer opposite the device layer.

One of ordinary skill in the art would have been motivated to perform the ablation in this manner in order to prevent the particles from damaging the components.

Furthermore, the background of the invention clearly states that the grit blasting is performed typically from the side of the wafer opposite the active surface.

Regarding Claim 13, as recited above, Verley teaches the use of aluminum oxide and silicon carbide for grit blasting vias in a silicon ink-jet substrate (Column 1, Lines 46-47). It would have been obvious to one of ordinary skill in the art at the time of invention to use the particles suggested by Verley in order to suitably form vias in the silicon substrate using grit blasting.

Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rogers, in view of Verley, Murthy, and Kamiyama and in further view of U.S. Patent 4,009,113 to Green et al., U.S Patent 5,286,703 to Wachi et al. and German Patent DE 4123900 to Rosen.

As applied above, Rogers, Verley, Murthy and Kamiyama disclose the method of the invention substantially as claimed, but Rogers does not show the use of a polyacrylamide layer. Rogers does teach the use of a water-soluble polymer as a temporary protective layer. Green teaches the use of polyacrylamide in a temporary protective coating (Col. 4, Lines 20-32). Furthermore, Polyacrylamide is known to be a common water-soluble polymer used for protective layers. Evidence of this fact is provided in Wachi (Column 27, Lines 55-68). Motivation to use a protective polyacrylamide layer is also provided in the Rosen reference (See Abstract). It would have been obvious to one of ordinary skill in the art at the

time of invention to use one of the water-soluble polymers of Rosen in order to suitably form a temporary protective coating that prevents debris contact as stated in Rosen.

One of ordinary skill in the art at the time of invention would have been motivated to use any water-soluble polymer known in the art that meets the requirements. Murthy suggests using polyvinyl alcohol but also points out that any polymeric material may be used that is coatable in thin layers and is soluble in a solvent that does not interact with the adhesive layer (Col. 6, Lines 47-50). Water is clearly the preferred solvent (Col. 6, Lines 58-60). Given these parameters, there are a limited number of polymers that have the desired characteristics. The polymer must have a linear or branched poly-alkane backbone with a sufficient number of hydrophilic groups to make the polymer soluble in aqueous phase, a tensile strength that is sufficient to resist mechanical degradation, a molecular weight that permits a melting point between approximately 40 and 90 ° C and a relatively low commercial production cost per pound to permit economical manufacturing. Note that the lower range limit for melting prevents degradation at operating temperatures and the upper range limit prevents damage to the other parts of the substrate at high temperatures.

The selection of a known material based on its suitability for its intended purpose supports a *prima facie* obviousness determination. See MPEP 2144.07.

Regarding Claim 16, as recited above, Verley teaches the use of aluminum oxide and silicon carbide for grit blasting vias in a silicon ink-jet substrate (Column 1, Lines 46-47). It would have been obvious to one of ordinary skill in the art at the time of invention to use the particles suggested by Verley in order to suitably form vias in the silicon substrate using grit blasting.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberts Culbert whose telephone number is (703) 305-7965. The examiner can normally be reached on Monday-Friday (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone numbers for the organization where this

application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

February 14, 2003

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